NSSA
الهيئة الوطنية لعلوم الفضاء
National Space Science Agency

NSSA Aman Payload

Presented by:

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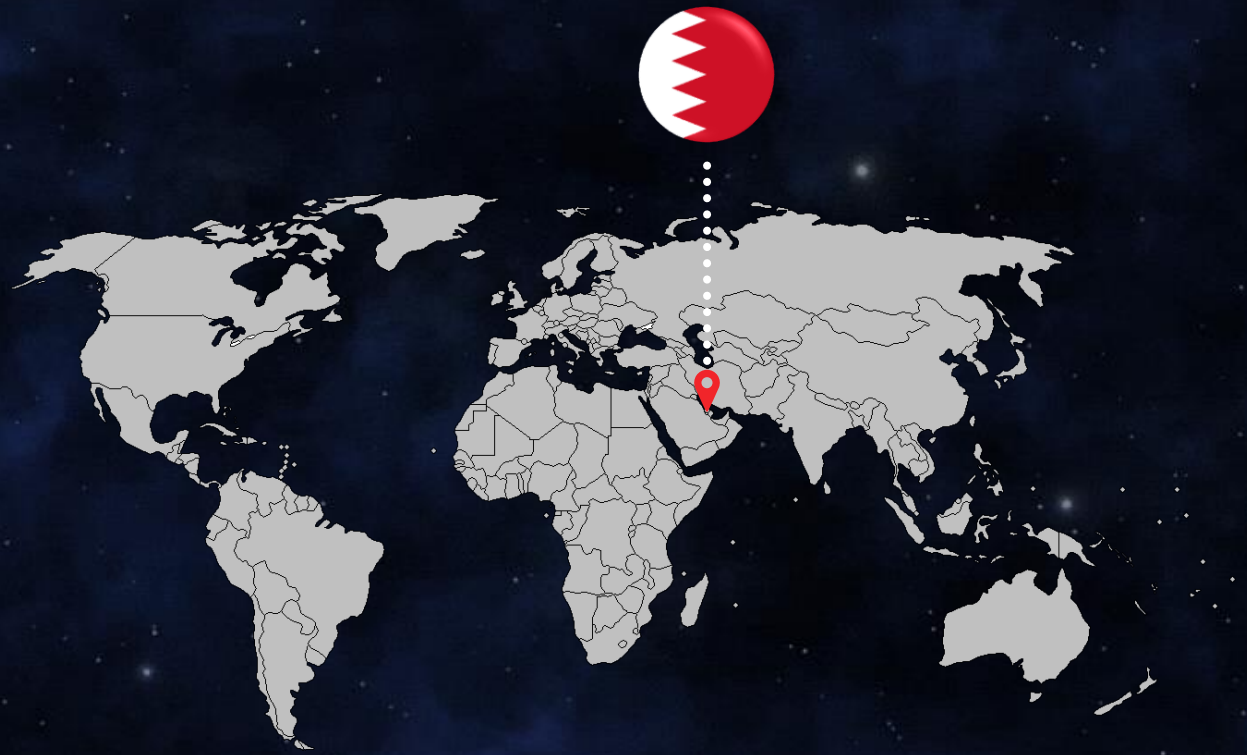
Outline

About Bahrain

Population
1.7M

Area
780 km²



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National Space Science Agency

The National Space Science Agency (NSSA)

was established by Royal Decree No (11) .

To Establish the Framework for creating a

National Space Sector

National Space Science Agency

National Space Policy was approved by the Cabinet in 2018

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NSSA strategic plan 2019-2023 announced in 2019

NSSA Strategic Goals 2019 - 2023

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National Space Science Agency

Promoting space science through awareness, developing advanced research programs and enhancing innovation

Constructing a sound infrastructure

Establishing relationships of cooperation on regional and international joint projects with space agencies and with technical, industrial and research organizations

Encouraging the Kingdom to become a party in international conventions and agreements of space science and associated technological concepts

Responding to national requirements through providing space information and earth observation data

Building national capabilities

NSSA Strategic Goals 2019 - 2023

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Payload Hosting Initiative “PHI”

In cooperation with the UNOOSA and MBRSC

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AMAN
أمان

NSSA participated with Aman payload which will be the first Bahraini payload

This initiative aims to develop a payload to be on-board MBRSC 12U satellite

The initiative was open to space agencies, research institutes, universities, public organizations, NGOs and some private companies.

5U volume is available for the payloads

Aman Payload Team

Eng. Aysha Alharam

Space Engineering Specialist

Eng. Muneera Almalki

Senior Space Engineer

Eng. Reem Senan

Senior Space Engineer

Eng. Yaqoob Alqassab

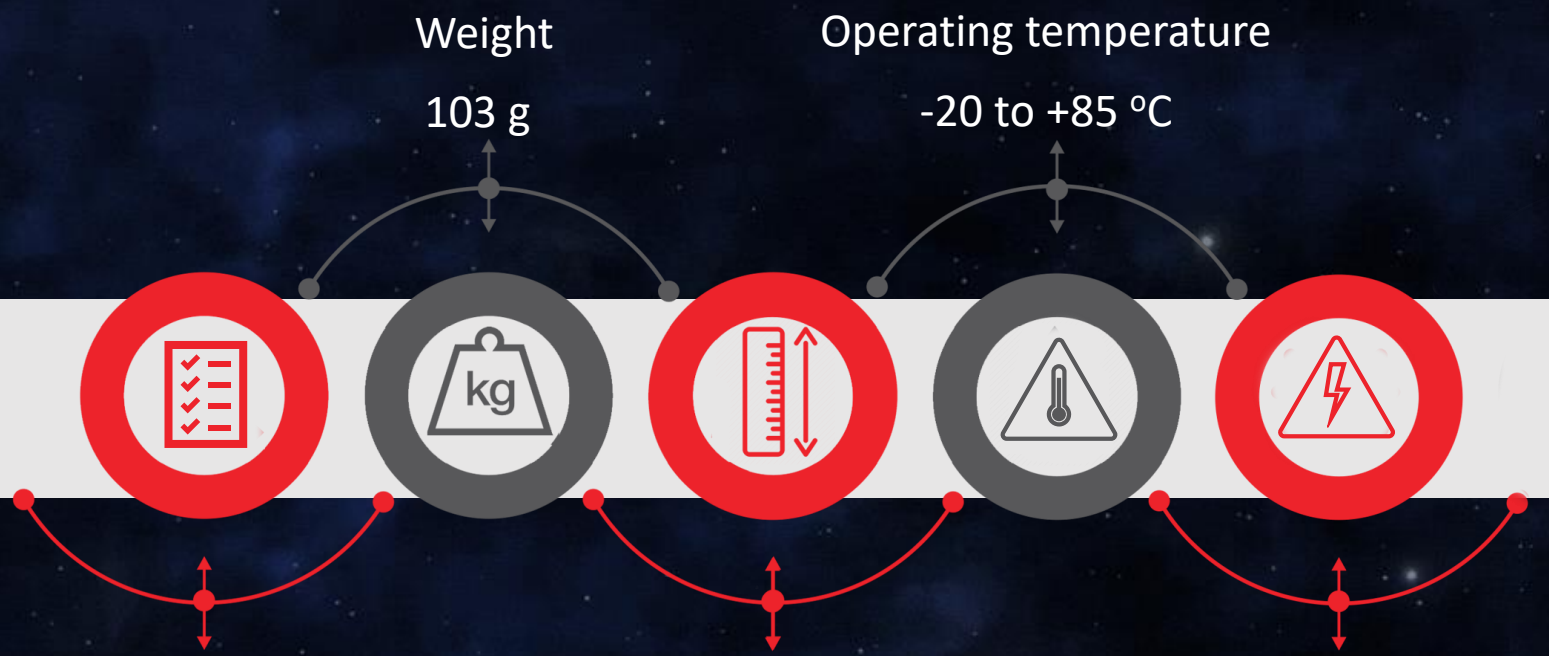
Senior Space Engineer

Aman Payload Objectives

- Design and implement an optimized encryption payload
- Test optimized Advanced Encryption System (AES) algorithm on FPGA
- Gain experience in designing, developing, integrating, and testing payloads
- Publish research papers

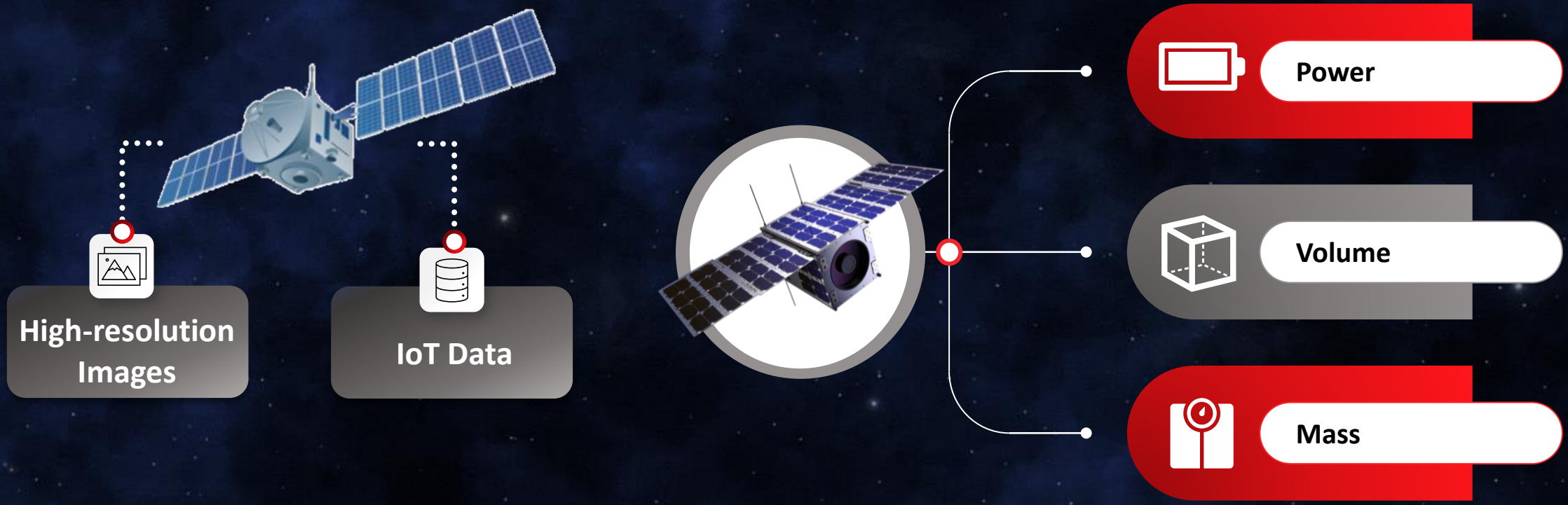
Aman Overview

Aman is the first Bahraini payload; its main objective is to secure the satellite data. Aman is an Arabic word, and it means "Security"



Small Satellites Limitations

- Small satellites provide us with very critical data such as IoT data, high-resolution images.
- However, they have limitations in the power availability, volume and mass.



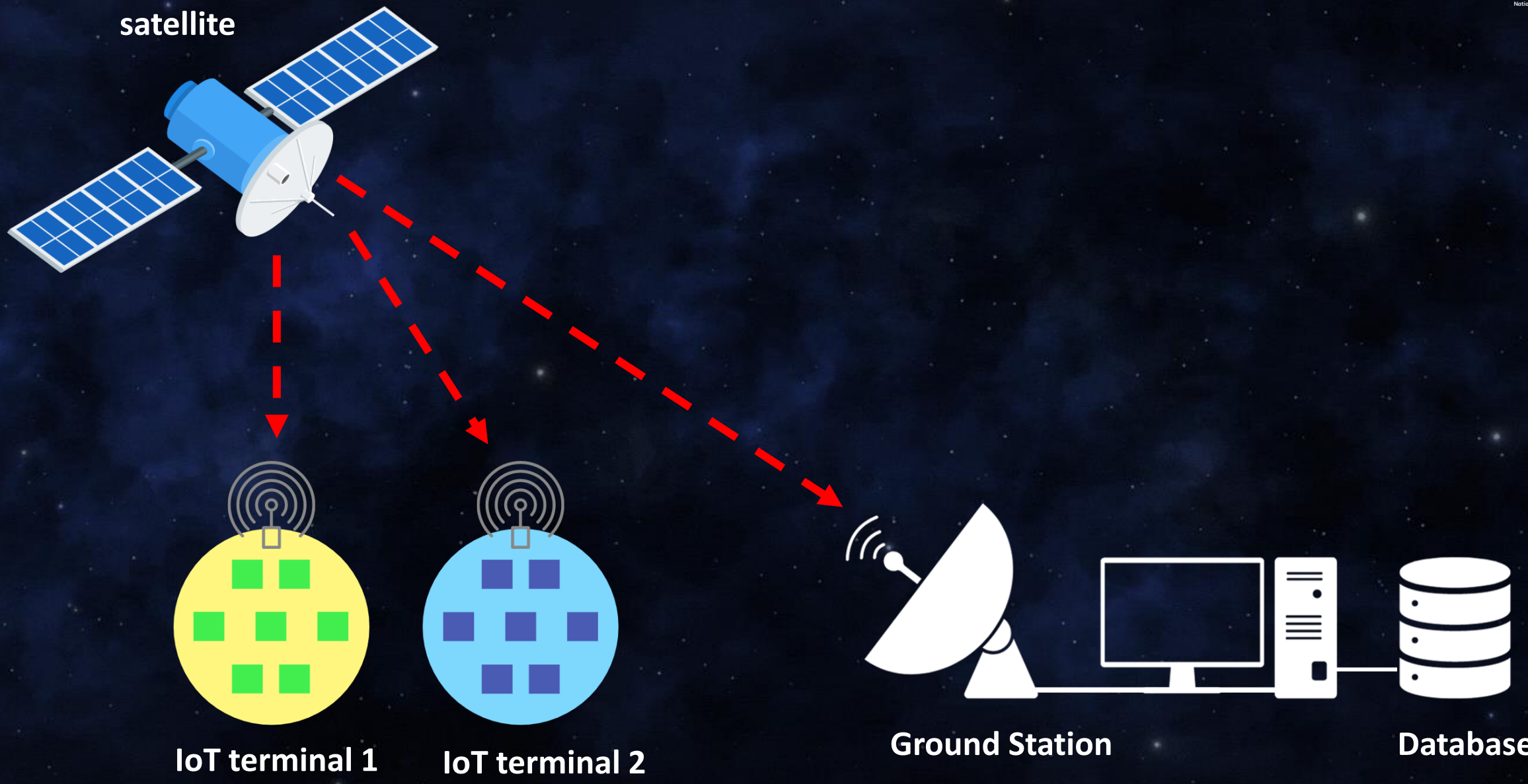
Importance of Satellite Cybersecurity

- Security attackers can access an organization’s database through disturbing the satellite signal.
- Aman payload will positively contribute to securing satellites data.

01	Satellite		An attacker may be able to access any downstream system connected to a satellite.
02	Ground Station		This can be done by disturbing its signal and thus, making the ground station particularly vulnerable.
03	Network		Therefore, the attacker can enter an organization's network in this fashion

Aman will solve this issue by implementing an optimized (modified) AES algorithm on FPGA board to increase system efficiency, reduce design complexity and reduce the power consumption.

The Main Block Diagram



Aman Software Implementation

User Authentication

- Message Authentication Code (MAC) algorithm is used as the authentication algorithm.
- The ground station and the satellite exchange a key for creating the MAC process.

Encryption /Decryption

- The encryption/decryption process is done using the 128-AES algorithm.
- AES is a complex algorithm that includes iterating 5 functions. It includes using complex matrix operations such as addition, subtraction, multiplication and inverse.

Impact on SDGs

6 of the 17 SDGs are positively impacted by the Aman payload project

By participating in this project, quality technical, vocational, and tertiary education will be gained.

Participating in building this payload will provide opportunities in STEM fields for women. Women represent 75% of the team.

This project will enhance the research and development in Bahrain. It will contribute to enhancing the skills of the team.

The Aman payload will ensure providing equal opportunities by reducing equalities in project participation.

By securing satellites, economic losses and damage to critical infrastructure will be reduced

Having secure satellite data will reduce hijacking and security breaches through safeguarding critical information.

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“Space and cybersecurity Engineer – MITRE Corp.

A cyberattack that causes two satellites to collide, or one satellite to collide with the International Space Station, destroying them and creating debris that makes the orbit permanently unusable.